REMARKS

In the Office Action, the specification is objected to under 35 U.S.C. §132; claims 14-26 are rejected under 35 U.S.C. §112, first paragraph; and claims 8, 10-14, and 16-26 have been rejected under 35 U.S.C. §103. Claims 8, 14 and 21 have been amended. Applicants believe that the rejections have been overcome and/or are improper in view of the amendments for the reasons set forth below.

At the outset, the Patent Office objects to the Amendment filed on March 31, 2004 pursuant to 35 U.S.C. §132 as it allegedly introduces new matter into this disclosure. While Applicants do not agree with this rejection, claims 8, 14 and 21 have been amended to recite, in part, the gas diffusion electrode has a thickness of less than 5 μm as clearly supported in the specification. For example, the specification provides that the thickness can range from about 2 to 4 μm. See, specification, page 7, lines 30-32. Moreover, the claims, as originally filed, recited, in part, that the thickness is no greater than 5 μm. See, claim 2. Therefore, Applicants believe that no new matter has been added in view of the amendments of claims 8, 14 and 22.

Accordingly, Applicants respectfully request that the objection pursuant to 35 U.S.C. §132 should be withdrawn.

In the Office Action, claims 14-26 are rejected under 35 U.S.C. §112, first paragraph. The Patent Office essentially alleges one skilled in the art would not be able to practice the claimed invention that includes, in part, an electrode with a thickness of about 5 μm or less. While Applicants do not agree with this rejection, claims 8, 14 and 21 have been amended as fully supported in the specification as previously discussed. Therefore, Applicants believe that one skilled in the art should be able to readily practice the claimed invention as presently defined and claimed as discussed above.

Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. §112, first paragraph, be withdrawn.

In the Office Action, claims 8, 10-14, and 16-32 are rejected under 35 U.S.C. §103. More specifically, claims 8, 10, 14, 16-18, 20, 21 and 26 are rejected in view of U.S. Patent No. 6,589,682 ("Fleckner") as evidenced by US 2003/0048057 ("Oyama"); claims 8, 11, 14, 16, 21 and 23 are rejected in view of US 6,013,371 ("Hager") in view of U.S. Patent No. 5,861,222 ("Fischer") as evidenced by Kordesch et al.; and claims 12, 13, 19, 22, 24 and 25 are rejected in

view of Fleckner and Newman and further in view of Hager. Applicants believe that the obviousness rejections have been overcome for at least those reasons as detailed below.

At the outset, the Patent Office primarily relies on Fleckner or Hager in support of the obviousness rejections. With respect to Fleckner, clearly this reference is distinguishable from the claimed invention.

Of the pending claims at issue, claims 8, 14 and 21 are the sole independent claims. Claim 8 recites a gas diffusion electrode operable within a fuel cell that includes a fibrous carbonaceous material wherein the gas diffusion electrode includes a thickness of less than 5 μm. Claim 14 recites a fuel cell that at least includes a proton conductor disposed between a first electrode and a second electrode wherein at least one of the first electrode and the second electrode includes a fibrous carbonaceous material that is formed on the proton conductor and wherein at least one of the first electrode and the second electrode includes a thickness of less than 5 μm. Claim 21 recites a fuel cell that includes, in part, at least one of a first electrode and a second electrode that includes a carbonaceous material wherein at least one of the first electrode and the second electrode includes a thickness of less than 5 μm.

According to the present invention, the fibrous carbonaceous material can be directly formed on the proton conductor. In this regard, it is not necessary to separately handle the fuel electrode and/or the oxygen electrode and thus the mechanical strength of the electrodes does not have to be taken into consideration. Therefore, the electrodes may be reduced in thickness. This can enhance the cell reaction and improve cell performance. See, Specification, p. 2, lines 19-26.

In contrast, Fleckner is deficient with respect to the claimed invention for at least a number of reasons. At the outset, Fleckner fails to disclose or suggest that the gas diffusion electrode composed of a carbonaceous material, such as a fibrous carbonaceous material, can be directly formed on the proton conductor material, such as an electrolyte film. Indeed, Fleckner merely provides that aligned arrays of fullerenes can be adhered to the surfaces of the flow field plate (FFP) to form the gas diffusion layer (GDL) of the fuel cell. See, Fleckner, column 6, lines 53-56. The electrodes (FFPs), GDLs, catalysts, and membrane electrolyte (PEM) together form the membrane electrode assembly (MEA) and constitute the functional components making up the individual fuel cell units as further disclosed in Fleckner at column 8, lines 5-8. Again,

Applicants have discovered that the fibrous carbonaceous material can be directly formed as one or both of the fuel and oxygen electrodes on the proton conductor, and thus, separate handling of the fuel and/or oxygen electrodes is not required.

Further, Fleckner fails to even mention the thickness requirements of the alleged gas diffusion electrode (100, 102) as even admitted by the Patent Office. See, Office Action, page 3. Indeed, Applicants have discovered that the fuel electrode and oxygen electrode are not required to be independent films, and thus, are not required to exhibit mechanical strength. In this regard, the thickness of the electrodes can be extremely thin, such as ranging from about 2 to about 4 μm. Moreover, Applicants have demonstrated that a fuel cell that incorporates the electrodes has a superior performance, such as an output of approximately 100 mW, 0.6 V, and further can be more easily manufactured by forming the fuel and/or oxygen electrode directly on the proton conductor. See, Specification, page 7, line 29 to page 8, line 5. Thus, Applicants believe that Fleckner is clearly distinguishable from the claimed invention for at least these reasons.

Further, Applicants do not believe that the remaining cited art relied on by the Patent Office in support of Fleckner can be utilized solely to remedy the deficiencies of Fleckner. For example, assuming arguendo that Oyama can even be asserted as prior art, which Applicants question, the Patent Office merely relies on Oyama for its alleged teaching regarding a fibrous carbon material. See, Office Action, page 4. With respect to Newman and Hager, the Patent Office merely relies on the teachings of same as they purportedly relate to a fibrous carbonaceous material that includes a mixture of carbon nanotubes and vapor grown carbon fibers. Therefore, even if combinable, Applicants do not believe that one skilled in the art would be inclined to modify Fleckner to arrive at the claimed invention in view of what Oyama, Newman and Hager allegedly disclose.

As previously discussed, the Patent Office has also primarily relied on Hager in support of the obviousness rejection with respect to claims 8, 11, 14, 16, 21 and 23. As even admitted by the Patent Office, the Hager reference fails to provide the thickness of the gas diffusion electrode for use in a fuel cell. See, Office Action, p. 5. As previously discussed, independent claims 8, 14 and 21 have been amended to recite, in part, that the electrode has a thickness of less than 5 μm.

Further, Applicants do not believe that Fischer and Cordesch can be relied on solely to remedy this deficiency of Hager. In Fischer, the electrode includes a proton-conducting polymer membrane with an electro-catalyst dispersed therein. See, Fischer, column 4, lines 32-39. Indeed, the preferred proton connecting polymer includes a fluorocarbon vinyl ether polymer (see, Fischer, column 4, lines 40-42), and further discloses that at a thickness of less than 5 μm, the electrode becomes increasingly less cohesive due to its high porosity (see Fischer, column 5, lines 56-58). Clearly, this suggests that Fischer is distinguishable from the claimed invention to the extent that it effectively teaches away from the claimed invention that recites, in part, a gas diffusion electrode within a fuel cell that has a thickness of less than 5 μm. Moreover, the Patent Office merely relies on Kordesch for its alleged teaching that a proton conducting material is sandwiched between an anode and a cathode in a fuel cell. See, Office Action, page 6. Therefore, even if combinable, Applicants believe that one skilled in the art would not be inclined to modify Hager in view of Fischer and Cordesch to arrive at the claimed invention.

Accordingly, Applicants respectfully request that the obviousness rejections be withdrawn for at least these reasons.

In the Office Action, the Patent Office alleges that Applicants information disclosure statement ("IDS") filed on March 11, 2002 fails to comply with the provisions of 37 C.F.R. 1.97, 1.98 and MPEP §609 because copies of the foreign patent documents, namely, JP 05166520, JP 2000003714 and EP 0226911 A1 and the paper entitled "Carbon Nanotube Membranes for Electrochemical Energy Storage Production" by Che et al. were not provided.

In response, Applicants respectfully disagree with the Patent Office regarding this issue. Indeed, Applicants submitted the IDS along with copies of the references at issue and discussed above on February 27, 2002 in the United Stated Patent and Trademark Office, a copy of the IDS documents as filed is attached herewith as Exhibit A. Further, Applicants received a postcard date stamped March 11, 2002 that indicates receipt by the Patent Office of the cited references along with the other associated IDS material. A copy of the date stamped postcard is attached hereto as Exhibit B. Therefore, Applicants respectfully request that the references at issue be considered as to the merits of this case, copies of which can be found in Exhibit A.

Moreover, Applicants respectfully request that the submission of such documents be considered as received no later than March 11, 2002 as evidenced by the date stamped postcard,

attached herewith as Exhibit B. Accordingly, upon review of the references at issue, Applicants respectfully request that the Patent Office provide Applicants' undersigned attorney of record with an initialed copy of PTO Form 1449 indicating that the references have been considered on the merits, and thus, made of record in the present application. If the Patent Office should have any questions regarding this request, Applicants kindly ask that the Patent Office contact the undersigned attorney of record directly, such as by telephone if deemed appropriate, in order to bring prompt resolution to this matter.

For the foregoing reasons, Applicants believe that the present application is in condition for allowance and earnestly solicit reconsideration of same.

Respectfully submitted,

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